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The Miami Conservancy Bulletin

NOVEMBER, 1920

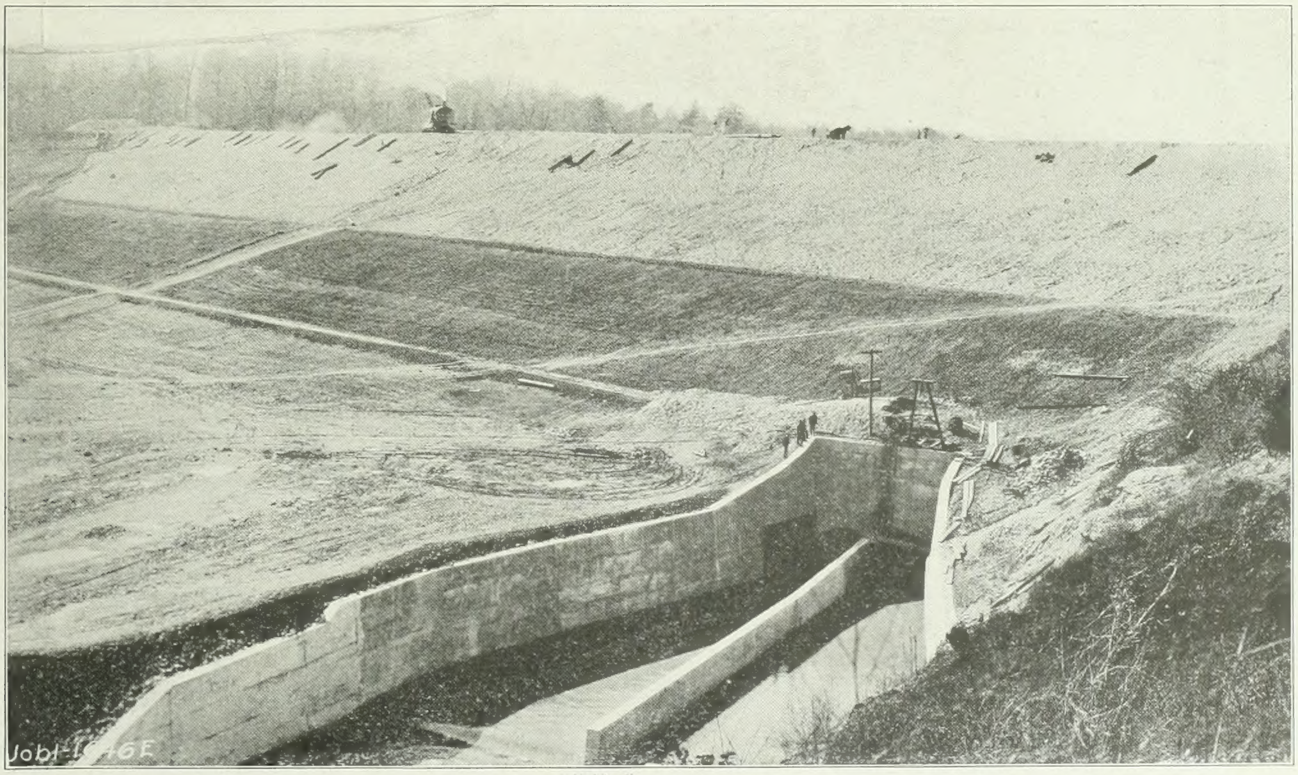
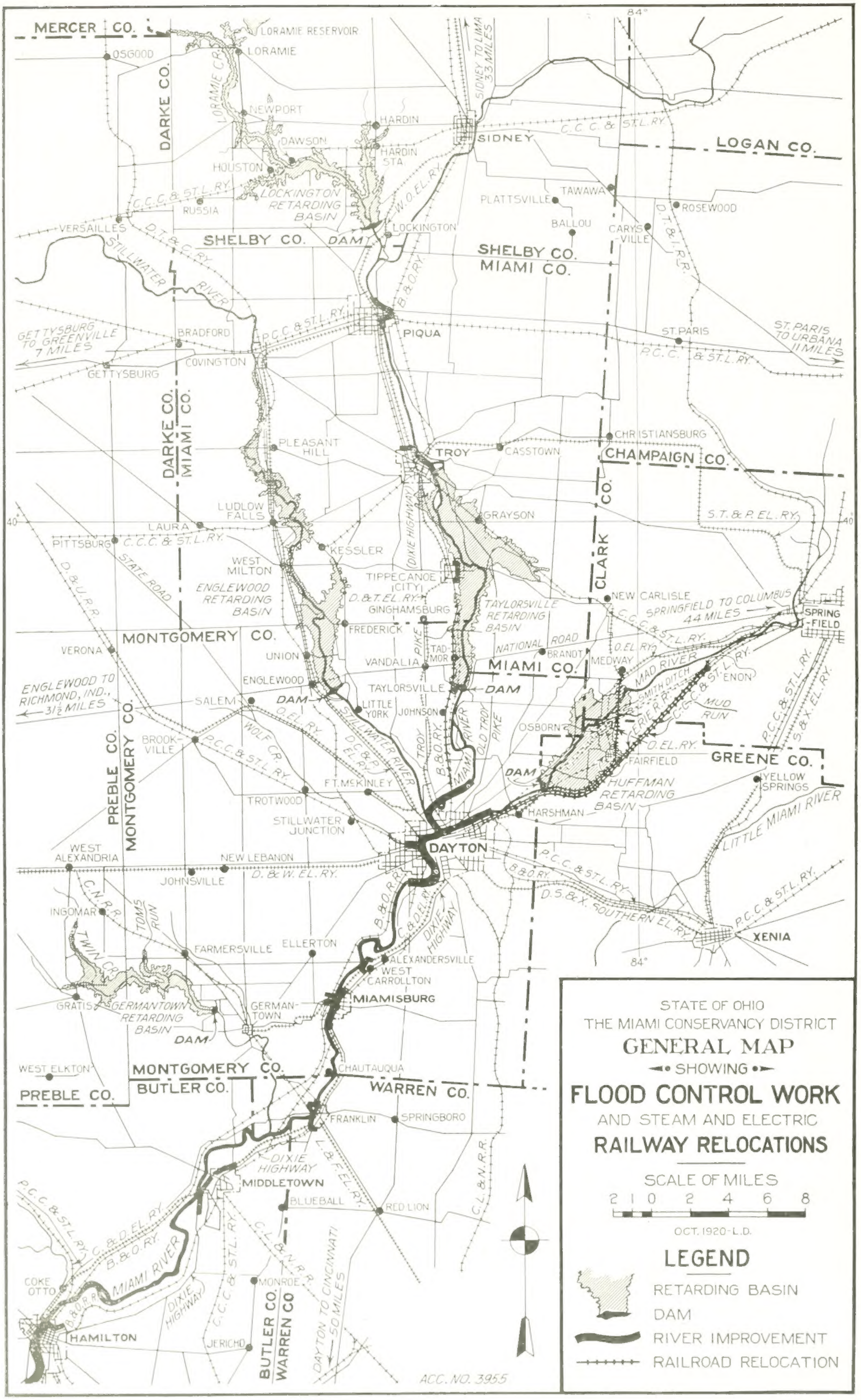


FIG. 211—GERMANTOWN DAM EMBANKMENT UP TO FULL HEIGHT, NOV. 4, 1920


STATE OF OHIO
THE MIAMI CONSERVANCY DISTRICT
GENERAL MAP
SHOWING
FLOOD CONTROL WORK
AND STEAM AND ELECTRIC
RAILWAY RELOCATIONS
SCALE OF MILES
2 1 0 2 4 6 8
OCT. 1920-L.D.
LEGEND
RETARDING BASIN
DAM
RIVER IMPROVEMENT
RAILROAD RELOCATION
MERCER CO.
LORAMIE RESERVOIR
LORAMIE
OSGOOD
DARKE CO.
LORAMIE CR.
NEWPORT
HARDIN
DAWSON
HARDIN STA.
HOUSTON
SIDNEY
SIDNEY TO LIMA 33 MILES
C.C.C. & ST.L.RY.
LOGAN CO.
LOCKINGTON RETARDING BASIN
RUSSIA
W.O.EL.RY.
TAWAWA
PLATTSVILLE
ROSEWOOD
VERSAILLES
LOCKINGTON
BALLOU
CARYSVILLE
D.T.&I.R.R.
SHELBY CO.
DAM
SHELBY CO.
MIAMI CO.
STILLWATER RIVER
B.&O.RY.
GETTYSBURG TO GREENVILLE 7 MILES
BRADFORD
P.C.C.&ST.L.RY.
PIQUA
ST. PARIS
ST. PARIS TO URBANA 11 MILES
COVINGTON
GETTYSBURG
DARKE CO.
MIAMI CO.
CHRISTIANSBURG
PLEASANT HILL
TROY
CASSTOWN
CHAMPAIGN CO.
CLARK CO.
LUDLOW FALLS
GRAYSON
DIXIE HIGHWAY
S.T.&P.EL.RY.
LAURA
PITTSBURG
STATE ROAD
KESSLER
D.&U.R.R.
WEST MILTON
TIPPECANOE (CITY)
ENGLEWOOD RETARDING BASIN
D.&T.EL.RY.
GINGHAMSBURG
TAYLORSVILLE RETARDING BASIN
NEW CARLISLE
SPRINGFIELD TO COLUMBUS 44 MILES
SPRINGFIELD
MONTGOMERY CO.
FREDERICK
PIKE
NATIONAL ROAD
VERONA
UNION
VANDALIA
TADMOR
BRANDT
MEDWAY
O.EL.RY.
MIAMI CO.
ENGLEWOOD
TAYLORSVILLE
DAM
MAD RIVER
SMITH DITCH
ENON
ENGLEWOOD TO RICHMOND, IND., 3½ MILES
SALEM
DAM
LITTLE YORK
JOHNSON
MUD RUN
ERIE R.R.
WOLF CR.
TROY PIKE
OLD TROY PIKE
OSBORN
BROOKVILLE
PREBLE CO.
MONTGOMERY CO.
DC&P EL.RY.
STILLWATER RIVER
MIAMI RIVER
FAIRFIELD
GREENE CO.
YELLOW SPRINGS
FT. MCKINLEY
HUFFMAN RETARDING BASIN
TROTWOOD
HARSHMAN
LITTLE MIAMI RIVER
STILLWATER JUNCTION
S.&X.EL.RY.
WEST ALEXANDRIA
NEW LEBANON
DAYTON
D.&W.EL.RY.
JOHNSVILLE
D.S.&X. SOUTHERN EL.RY.
C.N.R.R.
INGOMAR
TOMS RUN
TWIN CR.
FARMERSVILLE
ELLERTON
C.&D.EL.RY.
DIXIE HIGHWAY
XENIA
84°
ALEXANDERSVILLE
WEST CARROLLTON
MIAMISBURG
GRATIS
GERMANTOWN RETARDING BASIN
GERMANTOWN
DAM
WEST ELKTON
MONTGOMERY CO.
CHAUTAUQUA
PREBLE CO.
BUTLER CO.
WARREN CO.
FRANKLIN
SPRINGBORO
DIXIE HIGHWAY
L.&F.EL.RY.
C.L.&N.R.R.
MIDDLETOWN
BLUEBALL
RED LION
C.&D.EL.RY.
B.&O.RY.
MIAMI RIVER
C.C.C.&ST.L.RY.
COKE OTTO
MONROE
BUTLER CO.
WARREN CO.
DAYTON TO CINCINNATI 50 MILES
HAMILTON
JERICHO
ACC. NO. 3955

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Oren Britt Brown, Attorney

THE MIAMI CONSERVANCY BULLETIN

PUBLISHED BY THE MIAMI CONSERVANCY DISTRICT
DAYTON, OHIO

Volume 3 | November 1920 | Number 4

Index

Subscription to the Bulletin is 50 cents per year. At news stands 5 cents per copy. Business letters should be sent to Office Engineer, Miami Conservancy District, Dayton, Ohio. Matter for publication should be sent to Bulletin Office, Miami Conservancy District, Dayton, Ohio.

G. L. TEEPLE, Assistant Engineer, EDITOR.

Germantown Dam Embankment Now Up To Full Height

The pumping of material into the Germantown Dam Embankment was completed on November 4, a total of 796,000 cubic yards having been placed.

The placing of gravel to fill up the lower half of the conduits, this to be topped with the finished concrete floor, has already begun, the material being pumped into place like embankment material, but of course without admixture of any "fines." One conduit is closed against Twin Creek for this operation while the other carries the creek water. It is expected that this final work on the conduits will be done before cold weather, as also the last of the work on the spillway, the latter being practically completed now. Thus a spring flood will find the Germantown Dam affording complete protection.

Bound Volumes of the Bulletin

The index to the first two volumes of the Bulletin is being sent as a supplement with all copies of the present issue. If those desiring their Bulletins bound will kindly send us back the Index, with the issues, August, 1918, to July, 1919, inclusive, we shall be glad to attend to the matter for them. We have been able to arrange a price of $1.50 for this service, which is better than we had expected. Some missing issues can also be supplied at the regular price, but not all.

Map of the Conservancy Work

Attention is called to the map on the inside front cover page, showing the location and nature of the entire work of the District, as revised to date, including road changes. This map has been prepared with great care, and is practically a final map.

Third Report of the Board of Directors

The third annual report of the Board of Directors to the Conservancy Court has been made since our last issue. In general it shows that the work has gone forward at an excellent rate of progress, with a probability that it will be completed somewhat ahead of the anticipated date. The statement of financial conditions, showing receipts and disbursements brought up to June 30, 1920, is reproduced in summary on page 52. It shows an expenditure to June 30 of $26,637,491.76, and a balance on hand at the same time of $2,783,152.29. The special levy of $10,793,231.17, noted in our last issue, made necessary by the great increase in the cost of labor and materials since the original estimate was made, is expected to be sufficient to carry the project through to completion. Gratification is expressed at the excellent response of the taxpayers to the assessments, the delinquency on a total levy of $3,300,994.22 net during 1918 and 1919 being only $20,363.27, or six-tenths of one per cent. The favorable course of litigation is also noted. Appeals regarding benefits are now closed in five of the nine counties of the District, and no other litigation of importance is in prospect.

The report of Chief Engineer Morgan, appended to the report of the Board, gives the progress on the various construction features, brought up to Sept. 1,

Flood Control Works Proper

	To Oct. 1, 1918	To Oct. 1, 1919	To Sept. 1, 1920
Earth removed from cut-off trenches, outlet works, spillways and structures	274,680 cu. yds.	682,312 cu. yds.	877,010 cu. yds.
Loose rock, hard pan and solid rock removed from cut-off trenches, outlet works, spillways and structures	64,535 " "	357,412 " "	442,567 " "
Earth placed in dams	87,900 " "	1,504,012 " "	3,978,490 " "
Earth placed in levees	55,800 " "	374,209 " "	721,246 " "
Earth removed from river channels	47,190 " "	1,096,700 " "	1,467,327 " "
Earth moved in soil stripping and in dressing slopes with earth	100,127 " "	158,437 " "	181,276 " "
Earth moved in permanent road building	7,840 " "	41,437 " "	93,409 " "
Earth moved in sewer and drainage construction	2,360 " "	18,720 " "	25,242 " "
Concrete placed	11,680 " "	104,945 " "	144,734 " "
Clearing and grubbing	21 acres	80 acres	104 acres
Steel reinforcing and steel piling placed	0 pounds	535,607 pounds	1,446,245 pounds
Riprap placed	0 cu. yds.	0 cu. yds.	5,233 cu. yds.

Public Service Relocations

	To Oct. 1, 1918	To Oct. 1, 1919	To Sept. 1, 1920
Earth excavation	193,500 cu. yds.	1,560,770 cu. yds.	1,785,250 cu. yds.
Loose and solid rock excavation	270,500 " "	726,120 " "	* 713,207 " "
Concrete placed in structures	8,500 " "	30,620 " "	32,698 " "
Gravel placed on relocated roads	0 sq. yds.	21,900 sq. yds.	26,882 sq. yds.
Steel reinforcing placed	0 pounds	638,000 pounds	811,179 pounds
Track laid	0 miles	13.5 miles	47.98 miles
Track ballast placed	0 cu. yds.	6,000 cu. yds.	214,000 cu. yds.
Wire lines relocated	0 miles	0 miles	23.6 miles

* Small decrease due to change in classification.

1920. A summary of the volume of work done is reprinted on this page. The total force at work during the last winter was reduced to an average of 1,000 daily, with 1,200 on the payroll, the number being gradually increased with the advancing season to upwards of 1,700 on the payroll, with upwards of 1,600 at work each day. The contentment of the labor forces is noted, as well as the marked improvement in the efficiency of the average employee.

The state of the program at the several features is given as follows: The Railway Relocations are practically completed, permitting full speed at Taylorsville and Huffman. The Germantown Dam is also practically completed, as noted elsewhere, and affords full protection. The Englewood Dam is about half completed, and a little ahead of schedule, with the temporary spillway now built and protecting the construction against even a 1913 flood. The Taylorsville outlet is completed, except the spillway, so that the river closure can be made in the spring of 1920. Closure of Mad River at the Huffman Dam

(Continued on page 54)

Condensed Summary of Net Cash Receipts and Disbursements, August 12, 19915, to June 30, 1920.

	Aug. 12, 1915 to Dec. 31, 1919	Jan. 1, 1920 to June 30, 1920	Totals Aug. 15, 1915 to June 30, 1920
Net Cash Receipts			
Sale of Bonds (Net)	$19,594,900.00	$4,482,752.42	$24,077,652.42
Taxes	1,777,254.42	777,474.35	2,554,728.77
Assessments Paid in Advance	765,262.45	20,698.02	785,960.47
Interest Earned	357,565.08	95,906.26	453,471.34
Sale of Real Estate	115,094.36	15.00	115,109.36
Sale of Farms	53,619.16	310,729.70	364,348.86
Real Estate Operation Receipts	391,431.61	165,214.37	556,645.98
Engineering Department Receipts	135,279.92	52,349.76	187,629.68
Miscellaneous Receipts	129,698.96	12,641.91	142,340.87
Accounts and Notes Receivable	175,229.07	7,527.23	182,756.30
Total Net Cash Receipts	$23,495,335.03	$5,925,309.02	$29,420,644.05
Net Cash Disbursements			
Interest on Bonds	$ 1,925,000.00	$ 669,368.99	$ 2,594,368.99
Interest on Loans	40,241.00		40,241.00
Temporary Building	17,091.87		17,091.87
Osborn Items	128,035.00	5,889.93	133,924.93
Miscellaneous Items	9,545.10	1,495.00	11,040.10
Administrative Department	202,747.03	43,112.70	245,859.73
Legal Department	345,139.48	40,192.18	385,331.66
Taxation Department	219,975.72	17,163.72	237,139.44
Real Estate Investments	7,465,960.86	203,216.19	7,669,177.05
Land Operations	203,437.79	69,863.01	273,300.80
Crop Operations	43,540.82	3,361.98	46,902.80
Miscellaneous Land Items	5,328.45	38.19	5,366.64
General Expense	147,558.72	46,779.82	194,338.54
Engineering and Construction	12,539,948.63	2,243,459.58	14,783,408.21
Total Net Cash Disbursements	$23,493,550.47	$3,143,947.29	$26,637,491.76
Balance on Hand, June 30, 1920			$ 2,783,152.29

The Borrow Pit at Englewood

A Tract, 3,000 Feet in Length and Breadth, From Which 3,500,000 Cubic Yards of Material Is Being Excavated to Make the Dam Embankment.

By H. S. R. McCurdy, Division Engineer.

Broadly speaking, a hydraulic fill dam is composed of two general classes of material, namely, the fine-grained impervious central core and the coarse, porous outer portions. The function of the central core is to render the dam a water-tight barrier against leakage of impounded water in the reservoir. To insure this result the material forming the core should be extremely finely graded. It must settle in the water of the pool and form a compact, impervious mass, but this stiffening action should not be so slow that the core fails to resist encroachment from the gravel constituting the outer portions of the dam. For this reason a core composed of too fine grains is undesirable owing to the length of time required for it to expel its excess water and reach a condition of solidification.

The outer portions of the dam serve to confine the central core which, as sluiced into place, would otherwise flow to very flat slopes. Obviously the material forming the outer portions must be heavy and porous, heavy to resist displacement by the thrust of the semi-liquid core and porous to enable it to drain freely and to stand at the required slopes. In the Conservancy dams the core resembles a sticky, unctuous mud, while the outer portions are of sand and gravel. The combination of materials acts as a unit in forming a structure capable of resisting the thrust of impounded water.

With the foregoing rather exacting requirements in mind the borrow pits were selected. Fortunately Nature had dealt kindly with the Miami Valley in this respect; otherwise the dams would not have been built as they are.

At Englewood, as at the other dams, vast deposits of alluvial material were left by the ice "sheet" during the Glacial Epoch, and worked over by the torrents from its melting. These deposits are composed of sand and gravel in various proportions, overlaid with from two to four feet of fertile dark brown soil. The sands and gravels are ideal for the outer portions of the dam and, in addition, contribute a small amount of "fines" to the central core. The greater portion of the core, however, comes from the top soil.

The borrow pit at Englewood lies upstream from the dam, extending northerly to the National Road, a distance of about 3,000 feet, and will have an east and west width of approximately the same amount. It will cover roughly 200 acres. The depth of excavation averages about 15 to 20 feet.

Lying as it does in the river valley, the borrow pit affords no opportunity to sluice material into the dam by gravity. Several means of conveyance were feasible, but for economic reasons trains of side-dump cars were selected. The cars are of 12 cubic yards nominal capacity. Five cars constitute a train, which is hauled by a 40-ton locomotive. All track is standard gage.

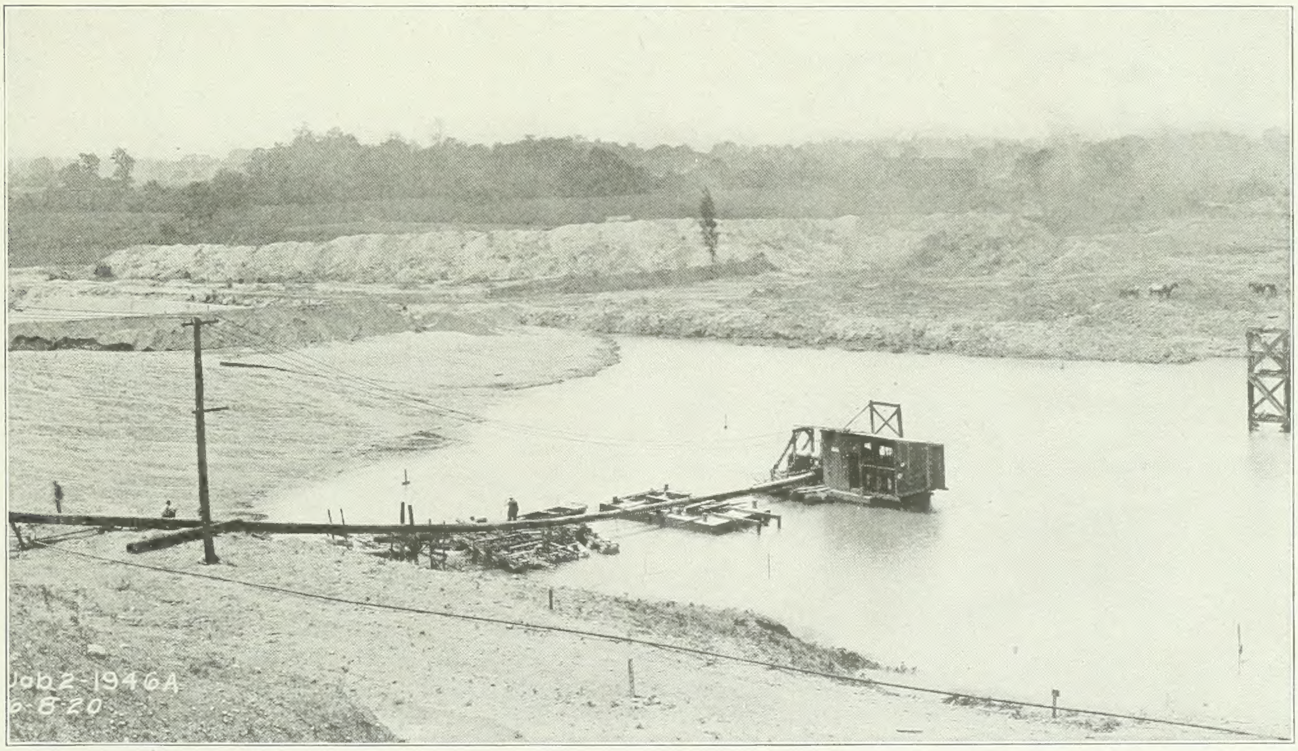


FIG. 213—CIRCULATION PUMP, ENGLEWOOD CORE POOL, RIVER SECTION, JUNE 8, 1920

Shown also at the left edge of pool in Fig. 214. Water came to the pool from the dredge pumps through the left-hand pipe in that figure, bringing materials for the dam embankment. These materials being dropped to the bottom of the pool, the cleaner water near the pool surface, emptied of its load of earth, was returned to the dredge pumps for a fresh load by the pump here seen. The pump was carried on a scow floating on the pool, and rose as the water in the pool rose with the growing dam enbankment.

FIG. 214—BEGINNING HYDRAULIC FILL OF THE RIVER SECTION, ENGLEWOOD DAM, APRIL 5, 1920
Compare with Fig. 215, which shows one month's progress on the embankment. The bank at the left in both pictures is the cross dam built on the old river bank to retain the core pool of the east section of the dam, this section being still farther at the left, out of the picture. A similar cross dam is out of sight at the right, on the old west bank of the river, to retain the west end of the river section core pool, the latter occupying the center of the picture. The entrance to the completed dam conduits, carrying the water of the river (in the foreground), is seen at the right. The old bed of the river is seen at the left of the conduits, cleaned of all silty material down to bed rock. The upstream toe of the dam embankment is just being formed by the material coming out of the pipe at the left, reaching across to meet the conduit entrance.

The material for the dam is excavated and loaded into the cars by two 115-ton draglines, one steam and one electric, fitted with 85-foot booms and equipped with 4½-yard buckets. Another smaller steam dragline is located in the borrow pit excavating material for concrete aggregates, gravel for ballast and a limited amount of fill for the dam.

The tracks are laid running north and south through the borrow pit, connecting at the dam with the pumping plants where are located the 15-inch dredge pumps which handle the material into the dam.

The cuts run north and south in the pit, the successive cuts progressing from west to east. The first cut was taken out near the river, the draglines loading onto a track to the east. While this was in progress a second track was laid down for use upon the completion of Cut No. 1. Progressively, across the borrow pit, tracks were laid, 150 feet on centers, as the succeeding cuts were made.

The draglines travel up one cut and dawn the next, being spaced about 1,500 feet apart along the cut. In this manner one reaches the middle of the pit as the other reaches the end and each moves to the new cut at about the same time. In each cut the dragline excavates the area between the face of the previous cut and the loading track, backing along as it works.

The method of operating the trains is as follows: One train stands at each dragline. As the train at the northerly dragline is loading its next to the last car the engine runner blows his whistle. At this signal the train at the southerly dragline proceeds to the northerly dragline. The time of loading the last car at the latter allows time for this move so that as the loaded train moves out its place is immediately taken by the other and the dragline is not delayed. There are six trains in service and the empties proceed directly from the pumps to the southerly dragline, waiting there for the trains to be loaded and move ahead. Should it happen that a train at the southerly dragline is fully loaded before a signal comes from the northerly dragline it moves directly to the pumps by means of a cross-over from the loading track. As the empty trains return from the pumps they pass the coaling and watering station and take on fuel as required.

While the dragline buckets are classed as of 4½ cubic yards capacity, experience with over two million yards has shown that each bucketfull builds 3 cubic yards of finished dam. To date the best dragline performance has been to load 274 cars, or 2,470 cubic yards, in a 10-hour shift. At three bucketfulls to a car this involves 822 scoops and swings. The average monthly output for each dragline, working two shifts, is a little over 75,000 cubic yards.

Report of the Board of Directors

(Continued from page 52)

is affected, and construction safety against a 1913 flood expected by winter. The channel improvement through the cities is progressing in general accordance with the schedule.

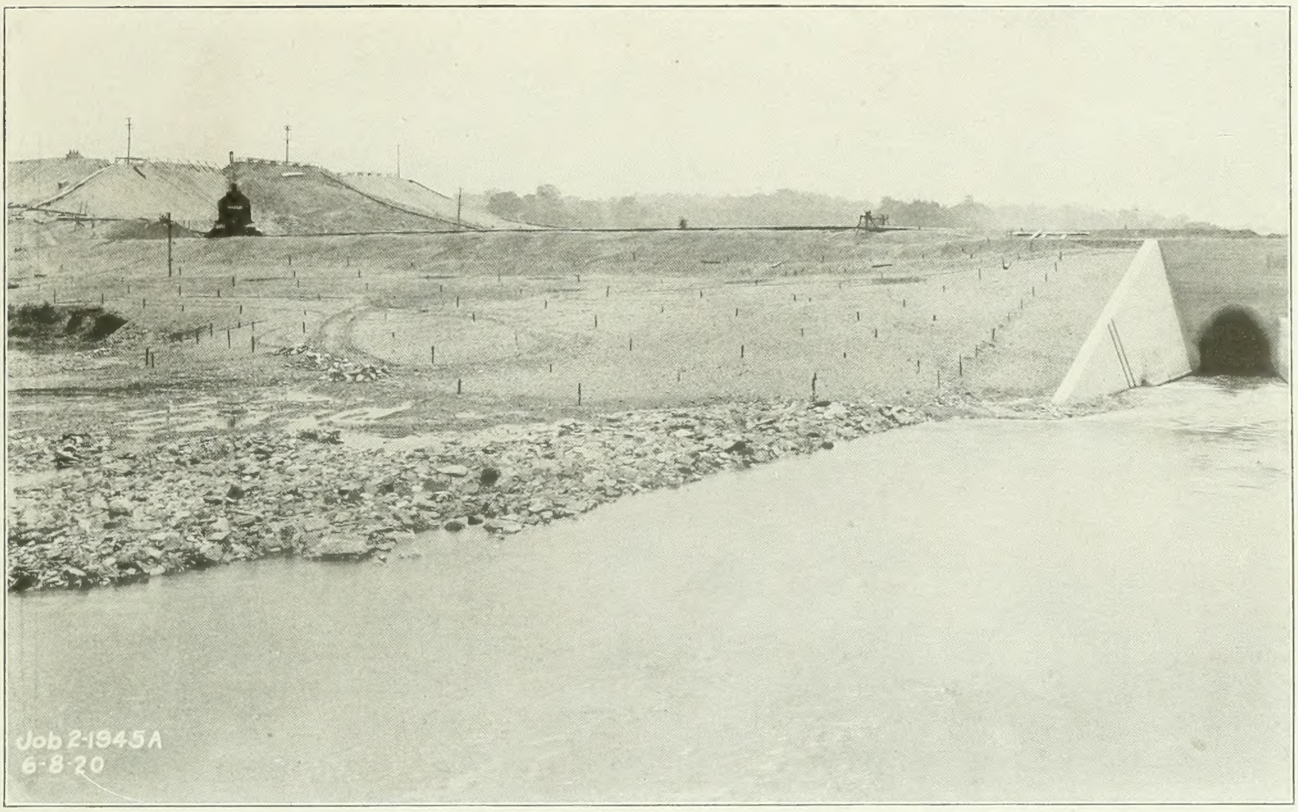


FIG. 215—RIVER SECTION, ENGLEWOOD DAM EMBANKMENT, JUNE 8, 1920

Picture taken one month and three days after that in Fig. 214, showing progress. The scale is given by the men beside the conduit entrance in Fig. 214. The small dragline excavator above is building the upstream levee which bounds the top of the beach slope of the core pool, which is unseen, beyond the embankment slope. The wood tower in the pool in Fig. 214 carries the pressure cells which give a measure of the stability reached at various depths in the dam core.

September Progress on the Work

GERMANTOWN

The entire length of the upstream slope and about half the downstream slope of the dam is now up to elevation 824. Thus only six more feet are needed to bring the dam to its final elevation.

During September 49,770 cubic yards of hydraulic embankment were pumped into the dam, making the total yardage pumped up to the end of September, 751,190 cubic yards. This is approximately 95 per cent of the completed structure.

Concreting of the spillway is being pushed to good advantage. The slope revetments, cut-off trenches and wiers in the spillway channel are completed. All piers of the bridge except the north abutment and the three central spans have been completed. Carpenters are building forms for the south approach span and for the parapet walls on the central span.

The installation of plant and equipment for putting in the permanent floor in the conduits is being rushed to completion as fast as possible.

J. C. McCann has completed his work with the steam shovel in the spoil banks near the outlet works, and removed the shovel from camp September 12. He is now grading and levelling by teams, which is only a few days work.

Arthur L. Pauls, Division Engineer.

October 19, 1920.

ENGLEWOOD

During the month ending September 25, all previous records for pumping hydraulic fill were broken, 162,000 cubic yards being placed. This month saw the portion of the dam across the old river channel carried up to an elevation of 10 feet higher than the section east of the river, of which the most had been built during the season of 1919. During the month, also, the two-millionth cubic yard was placed in the dam. On October 5 the depositing of material into the river closure was temporarily discontinued and preparations made for resuming fill in the section of embankment east of the Stillwater River. On October 11 this work was begun from Sump No. 3 and continued until October 14, when operations were transferred to Sump No. 2. The two sections of embankment now being continuous the fill will be carried up as a unit, over a length of 3,000 feet, using Sumps Nos. 2 and 3 in sequence. A fact perhaps worthy of mention in this connection is that the embankment in the river closure was carried up to a height of 82 feet in a few days more than 5 months, involving the handling of 750,000 cubic yards of material.

Cross Dam No. 2 was finished during the month and the electric dragline completed excavating the entrance to the temporary spillway.

Work was continued on the crib for the protection of the levee at the outlet of the temporary spillway.

A small amount of dry rubble paving was laid at the entrance to the outlet conduits. A granite tablet admonishing coming generations from utilizing the retarding basins for either storage or power purposes was set in the headwall at the outlet of the conduits.

A booster pump, for assisting in passing material to the extreme easterly end of the dam from Sump No. 2 was set.

H. S. R. McCurdy, Division Engineer.

October 15, 1920.

LOCKINGTON

During the last six weeks the hydraulic fill has been placed in the dam at an average rate of 57,200 cubic yards per month. The dykes on the dam, around the pool have reached a height averaging 27 feet from the finished top of dam. Extremely hard clay such as runs in the eastern part of the borrow pit, and at Taylorsville, has been encountered also in the northern part.

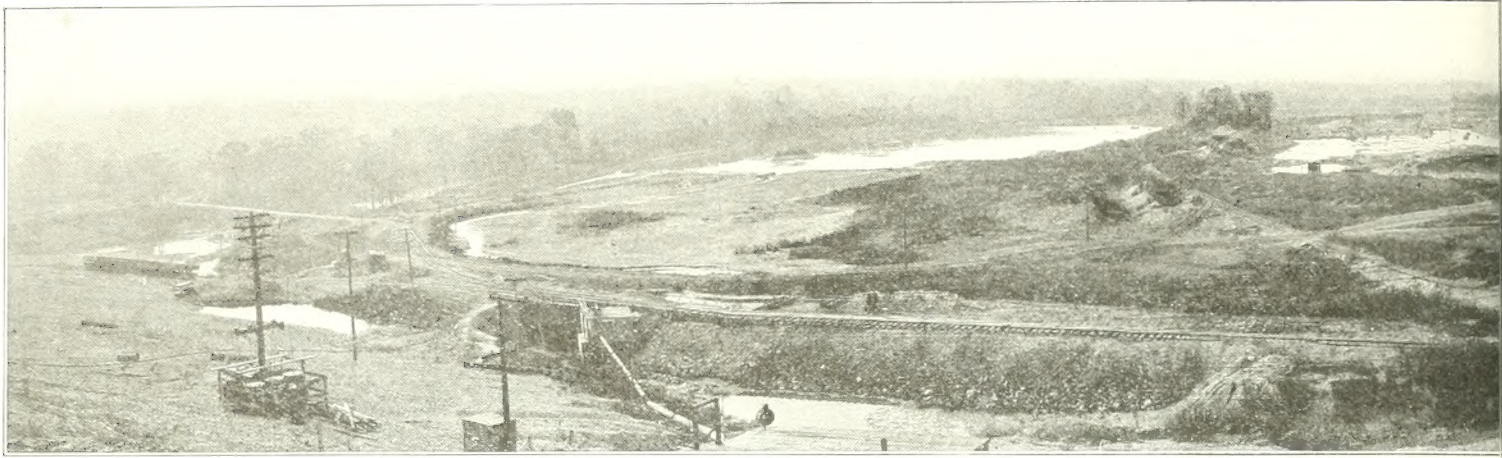


FIG. 216—PANORAMA OF BORROW PIT, ENGLEWOO

The stone surface dressing and paving on the dam is progressing satisfactorily and a part of it that was left unfinished last year is being completed.

An 8-foot concrete arch culvert 40 feet long was built on Road 9 preparatory to placing the fill of 4,500 cubic yards at Fox Creek, adjacent to the Western Ohio R. R. track. The fill will be made under contract with G. H. Heffner & Son. They are now moving a steam shovel to the work.

Gravel is being placed on Roads 9 and 10, to increase the original allowance for surfacing, which proved insufficient. Some bids have been received for the work on Road 11, known locally as the Bunker Hill Road.

Barton M. Jones, Division Engineer.

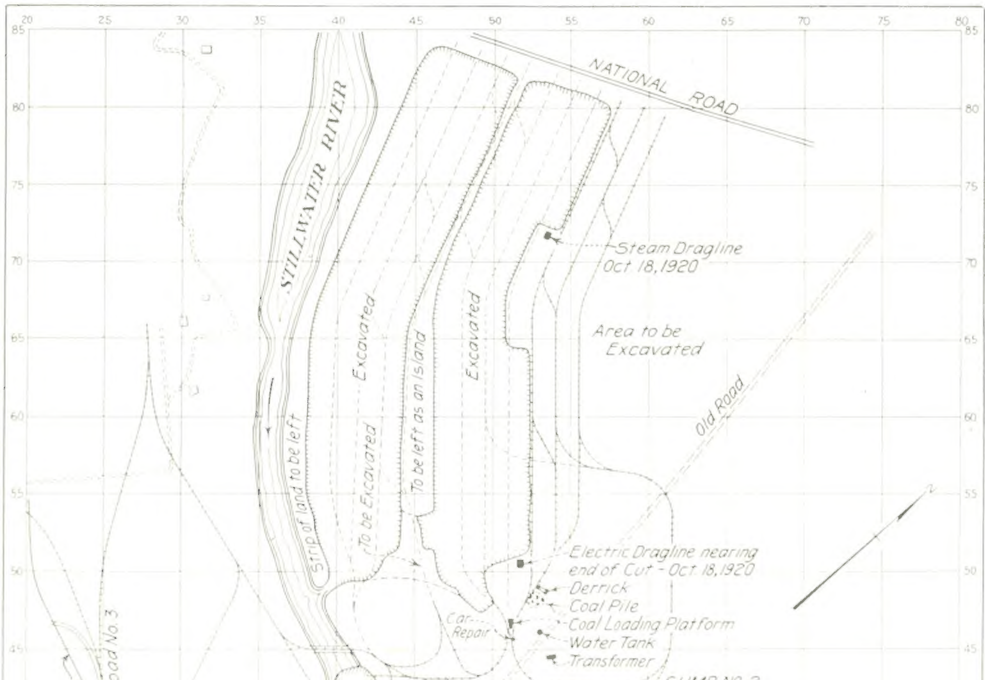
October 5, 1920.

TAYLORSVILLE

The Lidgerwood dragline has finished the excavation of the inlet channel to Station 4+50, which leaves about 250 feet more to be finished before moving down to the outlet channel.

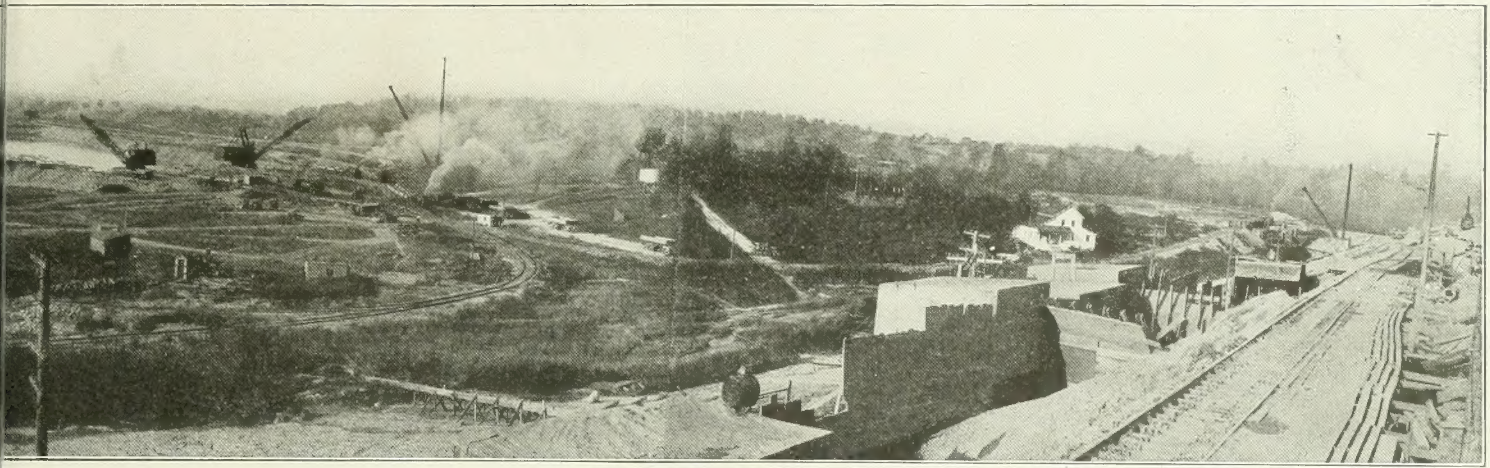
The sluicing at present is taking only the output of the dragline, which averages about 1,600 cubic yards per day, the sluicing being done in one shift, while the dragline runs two.

The concrete derricks have been dismantled and removed from the work; also the trestles and concrete tracks have been removed. The gravel plant has been dismantled except the bins and concrete mixer, these being left to mix the concrete for about 150 cubic yards of



This plan should be studied in connection with the panorama shown in Fig. 216, which gives a view of the borrow pit looking northwest from a point on the dam embankment just to the left of "Sump No. 3" in the plan. In the picture Sump No. 3 is seen in the immediate right foreground, Sump No. 2 beyond and to right of Sump No. 3, beside the derrick. The borrow pit extends about 3,000 feet from the dam to the National Road, which is just beyond the water occupying the excavated pit in the center distance. The two nearest dragline excavators and the third in the distance beyond, in right center, have done all the excavating, the one at the right (electric), and the one in the distance (steam), doing 98 per cent of it. The derrick for unloading coal for the locomotives (at right of the dragline), the water tank, transformer sub-station, etc., can be picked out by comparing the picture with the plan.

FIG. 217—PLAN OF ENGLEWOOD BORROW PIT



DAM, OCTOBER 22, 1920. SEE CAPTION OF FIG. 217

paving on the upstream toe of the dam near the inlet channel.

The Bucyrus dragline has been moved from the gravel pit to excavate and backfill for the concrete paving mentioned above. A part of this paving is below water and it is important to get it in before the big dragline completes the inlet channel.

Mr. Crampton has finished the grading on Road No. 12 to Station 80+00.

O. N. Floyd, Division Engineer.

October 26, 1920.

HUFFMAN

The last of the ballast gravel for the railroad relocation work was delivered on October 18, and the placing of material upon the dam was begun again by both the day and night shifts.

Twenty-eight thousand yards of material were placed in the dam embankment during the month of September.

The old Erie tracks have been taken up across the location of the dam, and the right-of-way is being cleaned off in preparation for building up the short section of the dam left out as a gap for the railway until the latter could be moved to its new location. The filling of this gap will tie the north end of the dam to the hill. The dam will now be carried up over the entire distance from the outlet works at the south end to the hill at the north end.

Stone is being gathered up along the old Erie Railroad bed and from the old stone bridge abutments, and is being placed as rip-rap along the sides of the entrance channel to the outlet works.

C. C. Chambers, Division Engineer.

October 23, 1920.

DAYTON

Dragline D-15 is working down stream on the right bank of the river between Washington Street and Stewart Avenue, cleaning up channel excavation and building the levee. This machine also built the ramp for a track to be used later in hauling the material from channel excavation between Fifth Street and Washington Street. D-16 has completed the fill back of South Robert Boulevard Wall and is excavating in the channel opposite, the material being scowed to the gravel plant. D-8 is unloading excavated materials at the gravel plant. D-19 is excavating in the channel west of Main Street.

Sunset Avenue wall has been completed and the derrick has been moved upstream and started excavating for First Street wall. Excavation for Beach Avenue wall has been nearly completed and two 16-foot sections of footing have been poured. Good progress is being made with Stillwater wall. A total of 1700 cubic yards of concrete has been placed, the wall being 46 per cent completed.

Finke Engineering Company is still working at the old launching basin, some of the material being hauled by teams to enlarge the levee between Helena Street and the Dayton Canoe Club house.

Price Brothers are placing revetment on the north bank of the river east of Dayton View bridge and driving piles for revetment on the east bank at Herman Avenue.

To date 42,900 cubic yards of sand and gravel have been issued from the gravel plant.

Summary of Excavation and Embankment

	Previous Cu. Yd.	During Sept. Cu. Yd.	To Date Total Cu. Yd.
Channel Excavation Item 9	605,000	20,000	625,000
Levee Embankment (Incl. Cont. No. 41	76,000	5,600	81,600
Total yardage handled	1,600,000	65,800	1,665,800

These figures do not include 105,000 cubic yards of excess excavation for the launching basin and scowing canals.

C. A. Bock, Division Engineer.

October 18, 1920.

HAMILTON

The electric dragline, D-16-18, has again passed under the railroad bridge, going north, and has started to excavate the last cut on the west side of the river, between Main Street and the railroad.

The total amount of channel excavation, item 9, to October 1, was 761,500 cubic yards.

Excavation and pile driving for pier No. 2, Black Street bridge, have been completed, and pier No. 2 has also been concreted to low water level. The Bucyrus steam dragline, D-16-17, has diverted the river to a new channel between piers 3 and 4, and has crossed the river to the west bank where it is excavating for piers 5 and 6. It is the intention to surround these two piers with one coffer dam.

The 24-inch water main across Old River has been lowered so as to pass below the bottom of the Ford tail-race. A second line of pipe is now being laid to take care of a future increased water supply. This work will be completed in a few days. It is expected that the Ford power plant will be in operation, and water turned into the tail-race, by November 1.

Excavation and concreting are being continued at the Black-Clawson wall.

The total number of concrete blocks manufactured to date at Price Bros.' block plant is 135,000. The concrete revetment on the east side of the river, between Main Street and the railroad bridge, was completed on Septmber 30.

C. H. Eiffert, Division Engineer.

October 20, 1920.

TROY

The dragline on the Jeffrey contract completed its river crossing and B. & O. Railroad crossing by October 5 and started excavating from the river channel below Market Street on October 9. To date it has excavated about 5,000 cubic yards from this section. The material is being placed on the left side of the channel cut and will be hauled away to spoil banks by the C. & C. Haulage Co.

The C. & C. Haulage Co. has excavated 19,000 cubic yards, Item 9, since the last report, bringing their total to 46,000 cubic yards. This excavation is between the Market and Adams Street bridges.

The Finke Engineering Co. has placed 18,500 cubic yards of material in the levees along Morgan Ditch. The first 1,100 feet of the south levee has been completed by the addition of top soil and seeding, and 500 feet of the north levee is practically ready for seeding. The material for the balance of the levees is being obtained from a borrow pit east of the M. & E. Canal and south of th Morgan Ditch.

The Pearson Levee has been completed by Wm. Oberer. This levee was made from side borrow and consists of 6,300 cubic yards over a length of 2,070 feet.

The surfacing and seeding of the levee made by McGillicuddy & Co., has been started and will be completed in the near future.

A. F. Griffin, Assistant Engineer.

October 20, 1920.

LOWER RIVER WORK

Miamisburg—Levee construction on the west side of the river has been completed and the contractors, Jeffrey, Boorhem & Co., have shipped out their equipment with the exception of the dragline machine and boarding cars.

Cole Bros. have constructed about 200 lineal feet of levee on the east side. Their dragline machine has been undergoing repairs since the middle of October, which accounts for the small amount of work done.

The Thos. & John S. Daniel Co. have commenced work on the elevation of Main Street and the construction of the section of levee which crosses this street at right angles just south of the north corporation line. They are using six "three-up" teams and 1½-yard bottom-dump wagons, loading with a small steam shovel.

Franklin—Jeffrey, Boorhem & Co. are nearly through with their train outfit on the west side levee construction. They are now placing top soil on the levee below Lake Avenue. As soon as this is done the dragline machine will move eastward through the gap in the levee just north of Lake avenue and close this opening. This will complete the west side levee except for dressing and seeding. Protection for the west side will not be complete, however, until the Miami Avenue wall is built.

The Thos. and John S. Daniel Co. are ready to commence work on the levee which is to extend eastward from the Dixie Highway opposite the Chautauqua dam, to the foot of the hill on the east bank of the canal.

Middletown—Work on concrete revetment between Fifth and Sixth streets is progressing fairly rapidly. The Price Bros. Co. is using two concrete mixers and an average of 25 men on this job. The work is about 40 per cent complete and at the present rate of progress should be finished in a little less than three weeks.

F. G. Blackwell, Assistant Engineer.

October 25, 1920.

RAILWAY RELOCATION

Fig Four and Erie—All of the trains of the Big Four and Erie are now operating over the new line, the Erie having been transferred to its new location October 4. The team tracks of the Erie at New Osborne have not been constructed. They will be started as soon as their location has been definitely determined. All of the Big Four and Erie construction is therefore complete with the exception of the team tracks mentioned, the new station, and other miscellaneous items of lesser importance.

The Springfield pike at Huffman is now open for public use, but is not complete, the finishing depending upon the removal of a temporary construction track now connecting the new railway line with Huffman Dam. This temporary track serves for the delivery of freight to the dam.

The signal system at Fairfield is complete, but the Tates Point signal system is not entirely so, because of delay in shipment of wire for the electric circuits.

Mr. M. K. Frank of Pittsburgh is dismantling the old Erie Railroad, he having purchased the rail and bridges, except the two truss bridges crossing the Mad River at Kneisly and Huffman.

Baltimore & Ohio Railroad—Mr. J. C. McCann has been awarded the contract for the widening of the embankment at the Narrows, and should complete this work, totaling about 7,000 cubic yards, during the month of November.

All of the rail in the old line has been taken up, as well as the bridges. The old ties also have been taken up, and are being shipped to other district work for construction purposes. The Baltimore & Ohio Railroad secured about 8,000 of these ties.

Ohio Electric Railroad—The Walsh Construction Company finished their contract on the electric line on the 29th of October. The track, trolley and pole line construction is thus practically complete from Dayton to Fairfield. There only remains to be done, between Fairfield and Huffman, the track connections to the old line, and also the two passing tracks. Beyond Fairfield, the new line will be built next season.

Albert Larsen, Division Engineer.

October 25, 1920.

RIVER AND WEATHER CONDITIONS

The rainfall in the Miami Valley during the month of September varied from 0.92 inches at the Lockington Dam to 2.85 inches at Fort Loramie. At Dayton it amounted to 2.62 inches or to 0.12 inches more than normal, reducing the accumulated deficiency since January 1 to 2.68 inches. The rivers were low during the entire month.

Observations taken by the local office of the U. S. Weather Bureau show that the mean temperature for the month was 67.9 degrees, or 0.9 of a degree more than normal; that there were 16 clear days, 10 partly cloudy days, 4 cloudy days, and 8 days on which the precipitation amounted to or exceeded 0.01 of an inch; that the average wind velocity was 7.6 miles per hour, the prevailing direction being from the southwest; and that the maximum wind velocity for five minutes was 26 miles per hour from the southwest on the 15th.

Ivan E. Houk, District Forecaster.

October 25, 1920.

The nearest railway to the Germantown dam being about 2½ miles away, this dump car, needed for the river work at Hamilton, had to be transported from the dam to the railway over country roads. It was loaded on a special broad-wheeled truck, and hauled by two traction engines, coupled tandem. One of these dump cars weighs 25,500 pounds.

All of the dams but Germantown are located close to railways, so that expedients like that shown do not have to be resorted to usually in shipping equipment.

FIG. 218—HAULING A 12-YARD DUMP CAR OVER COUNTRY ROADS FOR SHIPMENT, JUNE 6, 1920

The Stillwater Drive Retaining Wall

Concrete Structure 920 Feet in Length, and 20 Feet Above Slope of River Bed, Replaces Levee.

By E. L. Chandler, Assistant Division Engineer.

Stillwater Drive Wall, now in progress of construction on the north bank of the Miami River in Dayton, just east of Main Street bridge, is similar in its principal features to eight of the walls to be built as part of the channel improvement. The river being narrow at this point, a wall is required instead of the uusual levee, in order to secure the necessary additional cross section area in the channel to carry the assumed maximum flood flow, with minimum encroachment on the valuable property next the river. The wall will also facilitate the flow of the water under the northerly spans of Main Street bridge. The Miami bends so sharply opposite Stillwater Avenue that the direction of flow at Main Street is nearly at right angles to that at Herman Avenue, and the momentum of the water naturally tends to throw it to the outside of the curve, through the southerly spans of Main Street bridge, lessening the flow through the northerly spans. The new wall will not only enlarge the channel, but by an improved alignment provide a regular and easy approach to this bridge, and thus tend to equalize the flow through the spans. The total length of the structure will be 920 feet, extending from the wing wall of Main Street bridge to a point near the east end of Emmet Street. (See Fig. 220). For a distance of 672 feet, to the point where it meets the top of the new levee, the wall is 20.3 feet high above the finished channel slope. From this point upstream it gradually diminishes in height, continuing on an easy curve down the levee slope to the foot of the latter, where it stops, the channel width beyond being sufficient to permit the use of the ordinary grass-covered earth slope.

Two types of design are employed, the "gravity" section where the wall is below ten feet in effective height (at the upstream end), and the "semi-reinforced" section for the remainder. See Fig. 221. In the gravity wall no steel is used, the weight of the massive concrete being sufficient to support the thrust of the earth behind the wall. In the higher "semi-reinforced" parts, the introduction of the reinforcing steel to take part of the stress induced by thrust saves expense. The wall is built in 16-foot sections, the intervening joints being keyed and thoroughly coated with asphalt. The footing is poured in one operation, the shaft (from top of footing to bottom of coping), in a second, and the coping section in still a third. See Fig. 223.

The accessibility of the work and a consequent speeding up of progress, were much facilitated by a preliminary earth excavation, removing the material

FIG. 219—CONCRETING PLANT, STILLWATER DRIVE RETAINING WALL, DAYTON, OCT. 23, 1920

The truck at the left brings sand and gravel from the District's plant at Sunrise Avenue, and dumps it into bins as seen, their tops level with the roadway. From the bins these materials pass through measuring boxes to a small car below, which when loaded is hauled up the incline by an electric motor, to the bin seen above the concrete mixer (the conical drum of which is seen under the derrick boom). From this bin it passes by gravity into the mixer, and from that into cars which carry it to the concrete forms. See also Fig. 223.

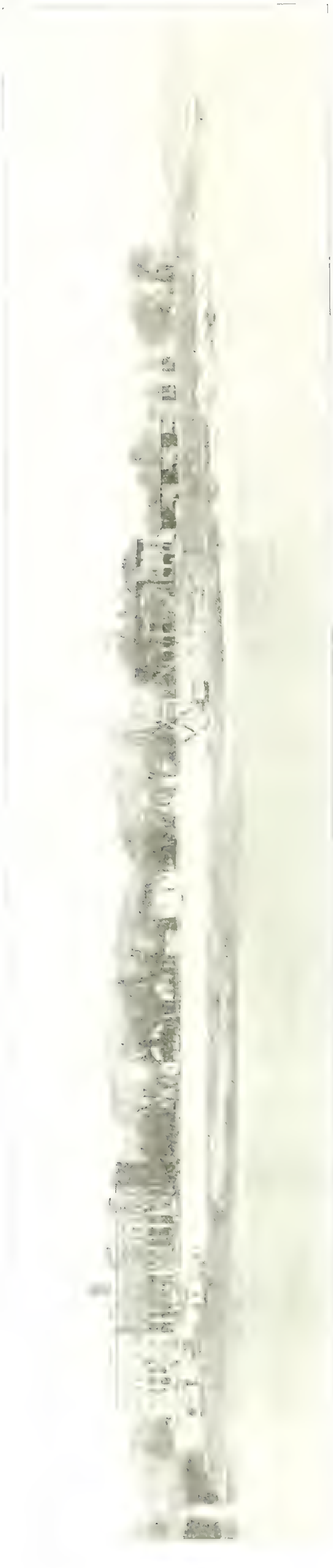


FIG. 220—STILLWATER DRIVE RETAINING WALL, DAYTON, OCTOBER 30, 1920

This wall, now a little more than half completed, is shown in its entire extent as it appears from the opposite (south) bank of the river. It begins at the east end of the north wing wall of Main Street bridge (at the left in the picture), and extends eastwardly for a distance of 920 feet, ending at the foot of the new levee, now under construction, at the end of Stillwater Avenue. It improves the general alignment of the river by cutting off the sharp corner of the bend in the river between the latter street and Linwood Avenue, and adds to the channel capacity of the river by cutting off part of the old levee which it replaces, and also by cutting off the wide river slope of this levee, substituting for this slope its own vertical face, twenty feet in height above the upper toe of the slope of the improved river channel, and twenty-eight feet above the level bottom at the middle of the stream. It meets the top of the new levee 672 feet east of the Main Street wall, and follows thence down the face of levee, gradually diminishing in hight, to its extremity at the foot of the embankment slope. Cross sections of the wall, which is of concrete, are shown in Figs. 221, the left-hand section (reinforced with steel), being used where the wall face is more than ten feet in height, and the left ("gravity") section (not reinforced) where the face is of height less than this.

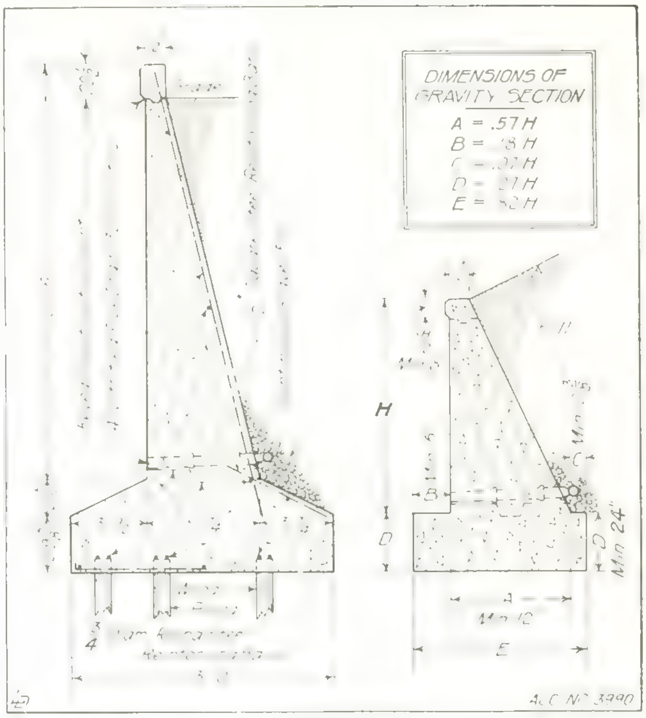


FIG. 221—SECTIONS, STILLWATER DRIVE WALL

down to the level of the top of the footing, not only that necessary for the wall construction, but that between the wall and the river. This work was well done by a "Type O," Thew steam shovel operating a ¾-yard bucket. The material was transported in wagons, the greater part being dumped on the big spoil bank (some day to be a park), between Emmet Street and Herman Avenue. A part was used to build a drive along the river from Linwood Avenue to this park area. To make room for the drive, three two-story brick buildings at the east end of Emmet Street had to be removed. See Fig. 220. The preliminary earth work referred to was done under contract by the Finke Engineering Co.; all other work by the District itself.

Following this excavation, the trench for the wall footing was dug by a stiff-leg steam derrick, equipped with 22-foot wood mast, 62-foot steel boom, 60 H. P. boiler and a Lawson and Morrison triple drum engine operating a one-yard clamshell bucket. To preserve the fine elms along the levee, which grow close to the wall location, 24-foot steel sheet piling was driven next the trench, to keep the earth in place about the tree bases, the piles extending up to the top of the old levee.

Upon excavating to the proposed level for the wall footings, it was found that the underlying material was fine sand and muck, too unstable to support the heavy wall, and that to secure solid foundation, [illegible] wood piles [illegible] driven down through about 10 feet of the sand and muck into the underlying gravel. The lateral spacing of the piles under the higher sections is shown in Fig. 221. Longitudinally, the spacing is four feet between centers. They are designed to carry the entire weight of the wall, each pile being equally loaded. [illegible]

According to the original scheme, all of the work of excavating, moving forms, placing concrete, and

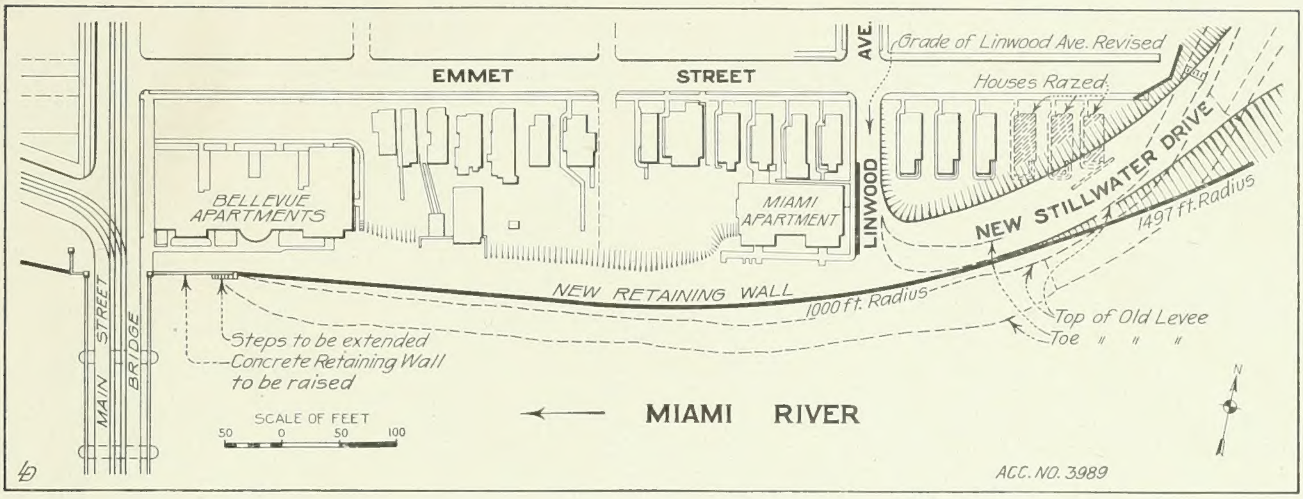


FIG. 222—PLAN, STILLWATER DRIVE RIVER WALL, DAYTON

backfilling after the completion of the wall, would have been performed by one derrick, but in view of the complications mentioned, it was necessary to install a second one to handle forms and place concrete in the shaft of the wall. Accordingly an electrically operated, stiff-leg derrick was assembled. It is of wood, with a 39-foot mast and a 56-foot boom, fitted with a Thomas double-drum hoist and a 40 H. P. motor.

Sand and gravel for use in the concrete are obtained from the District's plant on Sunrise Avenue. Bins for the aggregate are located near Main Street, the top of the bins being at street level. Dump trucks coming from the gravel plant discharge directly into the bins, from which the material is fed by gravity into a "charging" car of 24 cubic feet capacity. The loaded car is hauled up an incline by a hoist operated by a 15 H. P. electric motor, and automatically dumps into a 1 cubic yard Smith concrete mixer. The concrete is chuted into a narrow-gage car and hauled to the forms by a 3-ton Plymouth gasoline locomotive, running on a track built on a trestle somewhat higher than the top of the footing. For pouring footings, a radial gate, side dump car is used, the concrete being chuted directly into the forms. For the shaft, concrete is hauled in a bottom dump bucket seated on a flat car, to the derrick, which picks the bucket up and lifts it to the top of the form to discharge its load. The various features mentioned are to be seen in Fig. 219 and Fig. 223.

Three grades of aggregate are used in the concrete; sand less than 1/4 of an inch in diameter; fine gravel between 1/4 of an inch and 1 1/2 inch in diameter; and coarse gravel between 1 1/2 inch and 3 inches in diameter. For the footings the mixture is 3 cubic feet of cement to about 7.5 cubic feet of each grade of aggregate, while for the neat work, an extra 1/2 cubic foot of cement is used. The proportions are subject to change, depending upon variation of the aggregate.

The bucket is seen suspended over the form from the boom of the derrick, and about to dump its load. An empty bucket is seen on the small car in the foreground, with the locomotive (three foot gage, gasoline) beyond it. See also Fig. 219. These buckets are "bottom dump," the dumping being done by mechanism operated by the derrick. Another type of bucket, used in pouring the wall footings, is seen standing near the derrick. This is a "side dump" bucket, dumped by hand. The forms are 16 feet long and 18 feet, 6 inches high, the front and back "panels" weighing about two tons, being lifted into place by the derrick.

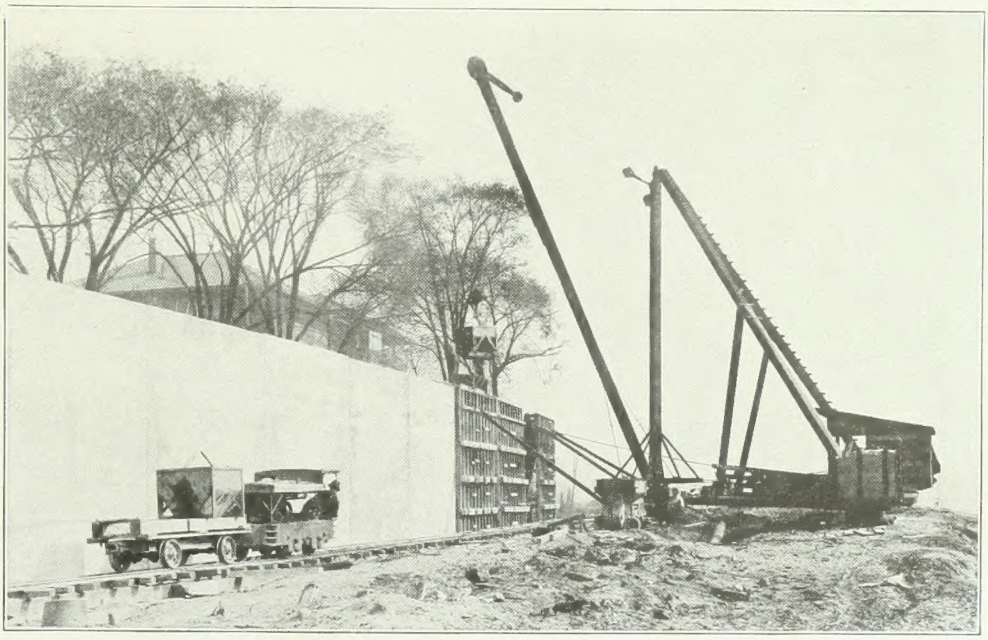


FIG. 223—POURING THE CONCRETE, STILLWATER DRIVE RIVER WALL, DAYTON, OCT. 23, 1920

Forms for the upstream end of the wall, where the dimensions vary, must be built in place and wrecked after pouring the concrete. For the greater part of the work, movable forms have been constructed in such a manner that they may be used repeatedly. Each 16-foot section of shaft requires but one panel for the front and one for the back. The dimensions of a front panel are 16′ x 18′-6″, being built of a 2-inch lagging with 4″ x 6″ studs and 6″ x 8″ and 8″ x 8″ wales. Each panel weighs about 2 tons, but with the aid of the derrick there is no difficulty in moving them as required. Three complete sets of forms are in use, making it possible to pour four or five sections in a week. The total height, approximately 18 feet, is filled at one pouring. The minimum time for pouring a complete section has been about 2 hours, the average being 3 hours.

In spite of the rapidity of the operation no serious injury to the forms has resulted. The front and back panels for each section are held securely in place by twenty-five 8-inch bolts passing transversely through the forms. The bolts are encased in tin tubes one inch in diameter, and after the forms are removed, the bolts are punched out of their tin casings and are ready for use again. More serious than the holding together of the forms, is the problem of external bracing. If the walls were being built in a trench, it would be a simple matter to brace against the trench walls. Under the existing conditions, with the river channel excavation practically completed, there is nothing on the river side of the wall higher than the top of the footing, and it is necessary to resort to long, sloping struts as shown in Fig. 223. The fact that the earth is of a loose, sandy texture, adds to the difficulty. By continued care, the greatest variation from true alignment at the top has been kept within $\frac{3}{8}$ of an inch. When the coping section is constructed, it will be possible to tie the coping forms to the already built concrete of the wall shaft, and thus obtain an accurate alignment which will eliminate from the ultimate appearance of the wall the slight irregularities mentioned. In conjunction with the coping construction, an iron pipe fence will be placed on the top between Main Street and Linwood Avenue.

At present writing, the steam derrick has completed its work of excavation and pile driving, and has moved back to a position near Main Street. It will again travel the length of the job, pulling the steel sheet piling and placing the required earth fill back of the wall.

At some future date, in the course of the development of the city's park and boulevard system, it is anticipated that a drive will lead from Main Street along the wall to the riverside park between Linwood and Herman Avenues.

The work is being done under the direction of C. A. Bock, Division Engineer, E. L. Chandler, Assistant Division Engineer, and H. A. Hanson, Superintendent of Construction, with David Wright and John Rosite in immediate charge.

Building the Revetment

Special Devices Used in Building the Flexible Revetment to Speed Up the Work.

Following the account of the successful practical test of the flexible revetment, in the Bulletin for June, 1920, an account of the method of laying it may be of interest.

The general order of the work is first to drive the piling, both of wood and steel; then to lay the flexible mattress; then to cast the slabs on the slope, including the low concrete wall at its foot; (see Fig. 225), and finally to cast the concrete cross walls capping the steel piling, together with the row of heavy blocks forming the river edge of the mattress.

The most interesting feature, because the most unusual, is the laying of the flexible mattress. The operation is shown in Fig. 224. It is very simple, yet the evolving of it is an excellent example of the application of ingenuity to the neat and easy performance of a job which, dealing with a refractory material like stiff steel guy cable, to be used in weaving together a continuous "rug" composed of hundred-and-twenty-pound concrete blocks, is not so easy as it might look.

The cable is of rather hard drawn, double-galvanized, half-inch steel, twisted of seven strands, and having a good deal of spring. The fabric of blocks must if possible be laid in place on the ground since if laid on a timber floor, the process of sliding it off into place involves a good deal of added expense, although, the edge of the river channel being dry except during floods, the expense of laying the revetment in water is obviated. Two holes are cast in each block, running squarely across the block, a foot apart and six inches from each end. Laid breaking joints, this brings the holes in line across the entire width of the revetment, to receive the cables—provided the blocks are laid accurately and the ground is evenly graded, the permissible play being only $\frac{1}{4}$ inch, the holes being $\frac{3}{4}$ inch and the cable $\frac{1}{2}$ inch. If the holes are not in line the cable binds in passing through. A grand total of 400,000 blocks requiring to be woven, calling for a total cable length of 900,000 feet, the necessity of easy weave becomes apparent, if excessive cost is to be avoided.

Several "kinks' had to be learned regarding the wire. One was the ease with which curves or bends in it slow up the weave, by binding in the holes. The cable naturally keeps the curve of the circular reels on which it is shipped, and this has to be taken out by running it through a set of three grooved wheels, set staggering, which give it just sufficient reverse bend to take out this curvature. It needs watching subsequently to keep accidental bends out, this proving to be a small but important detail.

So simple an operation as cutting it into lengths led into trouble. If the cutting were done with ordinary heavy metal shears, the stiff ends of the cut strands splayed out in a seven branched point which refused to thread the holes. Melting the wire in two with the oxy-acetylene torch was tried, but this ran into time and cost at a rate to make it prohibitive. Finally a pair of small circular arcs were ground in the shear jaws, apposite each other, one in each jaw, between which the cable is gripped and then sheared. This draws the strands together instead of splaying them out, and gives a bluntly rounded point which takes the holes readily.

The blocks are 12 in. by 24 in. by 5 in. thick, laid breaking joints as seen The ½ inch double galvanized steel cable is threaded through the holes in the blocks across the entire width of the revetment. The two holes in each block are threaded on the two cable ends as the men holding the block slip it into place, the cables being steered by the third man, who sits in front of them, as shown.

The tongs used to handle the blocks are simple, the horizontal handle carrying a vertical bar, to which the two tongs proper are hinged, biting the block with a powerful grip.

FIG. 224—LAYING FLEXIBLE CONCRETE REVETMENT, OCT. 30, 1920

The detail of the weaving was worked out, after considerable study, to a point of great simplicity, as Fig. 224 shows. The blocks are laid a row at a time, parallel to the levee slope and beginning at its foot. The cable is cut into lengths such that when doubled, they will thread through two adjacent holes at a time across the entire width of the revetment, with sufficient overplus to anchor into the slope slabs at one edge, and into the row of heavy blocks at the other.

The row next the levee is laid first, the free ends of a loop of cable being passed through the adjacent holes of adjacent blocks, loop after loop, down the row, the ends being pushed through a foot or two into the clear. The blocks of the second row are then laid, one by one, each being slipped over two adjacent projecting ends of cable, as seen in the picture, two men handling the block with a pair of special tongs, and a third man steering the cable ends into the holes. A fourth man follows, and pushes or pulls the cable through the holes till the ends are free to take the blocks for the next row. The four men constitute the gang. They do fifty lineal feet of revetment per day, on a weekly schedule, including all "stops for wood and water."

The general arrangement for casting the slabs on the levee slope is shown in Fig. 225. The forms are of steel, the sloping sides being of six-inch channel bars, the top a six-inch plate, and the bottom an angle bar resting on the edge of the upper row of blocks in the flexible mattress. Wider brace plates at the lower corners stiffen the forms. The corner connections are made by tenons on the ends of the upper and lower members, piercing mortises in the side pieces, the joints being locked by steel wedges driven through slots in the tenons The mixer runs along the top of the levee and discharges into the forms through a chute. The gang doing the work consists of nine men. The same outfit pours the walls and heavy edge blocks referred to in the be-

This operation follows the laying of the flexible mattress. The forms are of steel; the top a 6 in. plate bar, the sides 6 in. channels, and the bottom a 2½ in. angle bar. The channels are connected to the bottom piece by curved pieces to give a rounded corner at the foot of the slope. The pieces are joined at the four corners by mortise and tenon joints, locked by steel wedges driven through slots in the tenons. The two lower corners are braced by triangular plate pieces to keep the angle bar true.

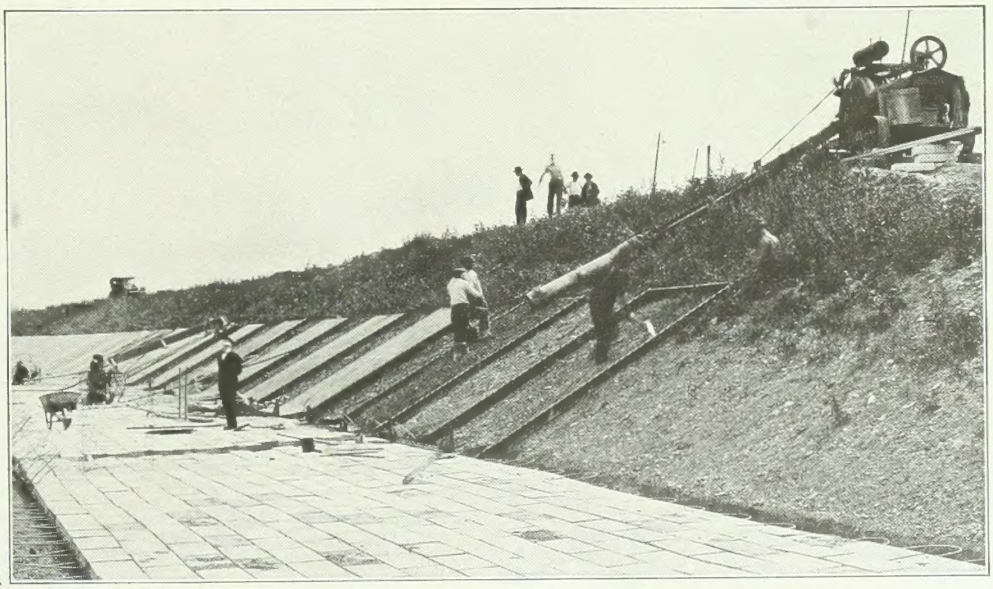


FIG. 225—CASTING THE CONCRETE REVETMENT SLABS, JUNE 2, 1920

This operation was at first done by hand, but the labor was so great, due to the binding of the cable in the holes (the blocks being difficult to keep in true line and grade on the hand surfaced gravel slope), that the device seen was invented. A 2-inch plank rests against the long edge of the block, carrying the lever seen in the man's hands hinged at its outer end. The two chains attached to the lever run to the handles of a pair of tongs which bite upon the cable, pulling it through the holes in the row of blocks as the man pulls on the lever handle. The device is simple and does its work well.

FIG. 226—PULLING THE STEEL CABLES THROUGH THE REVETMENT BLOCKS, OCT. 30, 1920

ginning. Alternate slabs are first cast with the forms, and then the intermediate ones in the usual manner. It is planned later to run the mixer on the flexible mattress, thus bringing it nearer the center of the work.

The work is being done by Price Brothers, Contractors, under a special arrangement. The details are due to Mr. Harry Price, senior member of the firm. The work is being done under the direct superintendence of Mr. H. S. Knight.

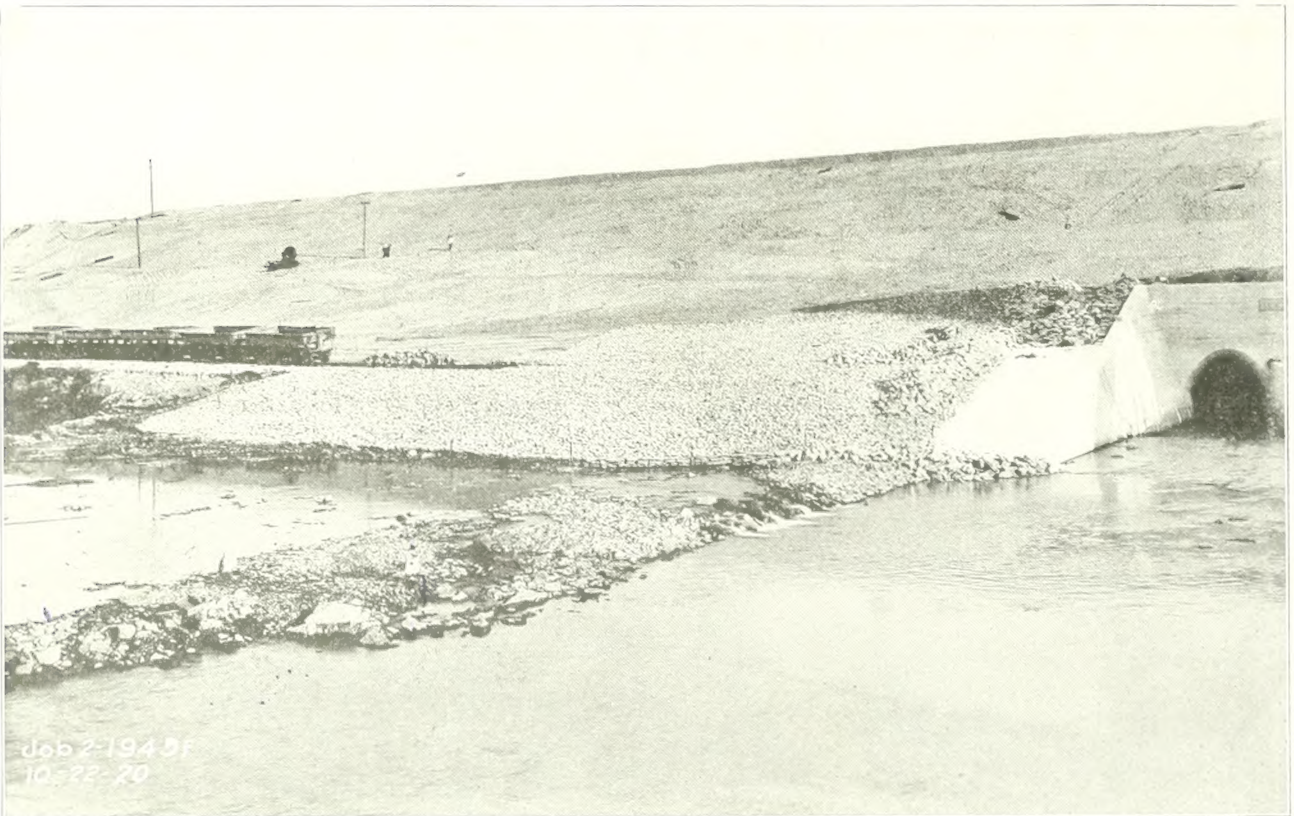


FIG. 227—RIVER SECTION, ENGLEWOOD DAM, OCT. 5, 1920.

This is shown for comparison with Figs. 214 and 215, to show the rapid rate at which this section of the dam embankment has been pumped. Pumping was begun May 6, one day before the date of Fig. 214. The section was brought to its present stage on Oct. 5, when work on it was temporarily stopped in order to bring the easterly section of the dam up to a corresponding level, after which the two sections will be united and the work carried up as one. During the month ending Sept. 25, all records of pumping were broken in the work on this section, 162,000 cubic yards of material being put in place. The total material pumped during the five months was 750,000 cubic yards.